Economics, Department of

Economics Theses

University of Puget Sound *Year* 2007

"Solving the Childhood Obesity Epidemic: Why and How"

Ana O'Neil
University of Puget Sound

“Solving the Childhood Obesity Epidemic: Why and How”

By

Ana O’Neil

Submitted to the University of Puget Sound
Department of Economics
In Partial Fulfillment of the Requirements for the B.S. Degree
November 13, 2007

Abstract:

Over the past thirty years the incidence of childhood obesity in the United States has nearly tripled. This paper will discuss the market and government failures that have had the most impact on the increase in childhood obesity trend and explain why public policy intervention is necessary and warranted. Solutions aimed at curbing childhood obesity should be focused on the educational arena, primarily in schools. Primary education occurs during a fundamental time for childhood development of tastes and preferences and has the most potential for success.

Introduction:

In this paper I start by reviewing some of the literature that has been published on the topic of childhood obesity and looking at the different issues that have been brought up, trends that have been highlighted, and possible solutions to the problem that have been suggested by other economists. I continue by explaining and detailing each of the three main market failures associated with childhood obesity: negative externalities, information asymmetry, and childhood irrationality. Next, I clarify how a glaring government failure, food subsidies, has also contributed to the obesity problem. After that I discuss the charged political economy surrounding obesity and how it may affect possible solutions to this problem.

From there I conclude that educational programs have the potential to be incredibly successful and are the most fundamental reform needed. I give an overview of some of the discussion concerning the ways in which tastes and preferences for food are formulated among young people; then show how this can be incorporated into school programs to make them stronger. I evaluate two successful school-based nutrition programs, and then illustrate how these programs can effectively counteract the market failures and lessen the social welfare loss associated with misallocation of society's scare resources and its correlation with childhood obesity.

Obviously there are many different causes contributing to childhood obesity, the main ones being: social or cultural, genetic, and economic. This paper focuses on the

underlying economic causes of childhood obesity and evaluates solutions to this problem using economic and market approaches. I determine that the majority of the barriers to implementing policies to combat childhood obesity lie in the political and cultural values of the United States. This is what focused my attention on education reform. ***Childhood obesity in the US is exacerbated by a complex array of government and market failures; although there are many public policy measures that could be put in place to combat childhood obesity a focus in the educational arena, primarily in schools, is the most fundamental and practicable reform necessary.***

Literature Review:

Background

There is a small but growing body of literature on the topic of childhood obesity that discusses why it is a societal problem. There is also literature describing the market and government failures that contribute to childhood obesity and some general trends that surround the problem. Some possible solutions are evaluated and suggestions made to help alleviate this public health issue.

Over the past thirty years the childhood obesity rate[1] for preschool-aged children and the obesity rate for teenagers have both doubled, while the obesity rate for adolescents has nearly tripled over that same time frame (Division of Nutrition 2007, 19). This increased instance of childhood obesity and the subsequent comorbidities, such as the increased likelihood of heart disease, instance of type 2 diabetes mellitus,

[1] Childhood obesity is hard to quantify but is defined by CDC and AMA as a child being above the 95% in body weight Index(BMI). Overweight is defined similarly as being at or above the 85% of BMI.

hypertension, and sleep apnea, among other health problems has led to increasingly high healthcare and social costs. Given Medicare and Medicaid's precarious state of finances, and the upward spiraling cost of healthcare in the United States, this growing problem will contribute to even more serious health and financial consequences in the future, if not addressed immediately.

Studies show that over 80% of overweight children become overweight adults, which intensifies the health and financial burden on the United States (Division of Nutrition 2007, 19; Ebbeling, Pawlak, and Ludwig 2002, 473-483). Treating adult obesity has not been terribly successful. It is very difficult for adults to maintain long term weight loss and there is a health risk associated with weight-cycling [also known as the yoyo effect]. Weight-cycling, the cyclical increasing and decreasing of large quantities of weight on a regular basis, is observed in many adult weight loss efforts (Riggs 1998, 1-16). Many studies have suggested that treating obesity during childhood would be more effective and have better long term results that treating obese adults (Cawley 2006, 69-88; Fowler-Brown and Kahwati 2004, 8; Riggs 1998, 1-16).

It is unsettling to note that obese children are facing a slew of serious obesity-related diseases, many of which used to be viewed as exclusively adult health issues. There are a large number of cardiovascular problems such as hypertension, dyslipidaemia, and increased blood clotting, which contribute to increased instances of coronary arteriosclerosis and lesions (Eberstadt 2003, 1-10; Must 1992, 1350-1355). Furthermore, overweight children have twice the likelihood of heart disease in adulthood and are diagnosed with Type 2 diabetes at shockingly high rates [especially considering that the disease was virtually unheard of in adolescents until recently]

(Ebbeling, Pawlak, and Ludwig 2002, 473-483). Additionally, less harmful diseases such as sleep apnea, asthma, exercise intolerance[2], eating disorders, and an assortment of self-esteem issues have also been seen as correlates of childhood obesity that are harmful to childhood development and well being (Krebs and Jacobson 2003, 424-430). These health problems highlight the negative externalities associated with children being overweight.

In recent years a number of surveys have been conducted to determine how Americans perceive the problem of childhood obesity and the amount of support there is for policy measures aimed at reducing the childhood obesity problem. John Crowley compiled these surveys and determined that almost all of them find that at least two thirds of respondents consider childhood obesity to be a "major" or "serious" problem in American society. In the Harvard Forums on Health Poll of 2003, 76% of respondents said that they would be willing to support school-based policies to reduce childhood obesity, even if it meant an increase to their taxes. Various other surveys reached similar conclusions (Cawley 2006, 1-29). It seems that citizens' willingness to pay for the reduction in the obesity trend signifies a definite need to do something about the problem, and helps to justify the public policy suggestions in this article.

Trends & Suggestions

Contributing Factors:

There are a huge number of factors that play into childhood obesity. Battle and Brownell wrote, "It is hard to envision an environment more effective than ours [in the

[2] In cases of obesity often the extra weight puts so much strain on joints and muscle tissue that exercise is extremely difficult and can result in injury.

USA] for producing…obesity." (Brownell, Kelly D. 2003). Unfortunately this seems to be true; there are so many factors that have led to the increased incidence of childhood obesity it is hard to separate them and figure out which ones are the greatest contributors.

Economic studies and models usually assume consumer rationality. However, children are not viewed as rational consumers by most economists because their cognitive abilities are not fully developed (Cawley 2006, 69-88). This makes the problem of childhood obesity even more of a public and societal issue. We cannot assume children, especially young children, are obese solely due to their own individual choices unlike what often is assumed with adults. The childhood obesity problem has been intensified by market failures such as information asymmetry and the negative externalities associated with high fat and high sugar foods. Additional government failures in the form of welfare laws, tariffs, and food subsidies have only added to the problem.

The Role of Healthcare Providers:

Some of the literature looked at the ways in which American insurance and healthcare are configured and argues that pediatricians should be taking a greater role in fighting the obesity trend. In *Pediatrics* magazine a policy statement from 2003 suggests that the most useful agent in reversing the childhood obesity trend would be the pediatrician. The authors argue that as leaders in communities, pediatricians have the respect and expertise to encourage change and be heard. The authors argue that insurance companies should recognize obesity as a health problem and subsidize the cost of therapy, to some degree (Krebs and Jacobson 2003, 424-430). Joseph Riggs, at

the Council of Economic Affairs, also looks to pediatricians and health care providers to help inform the public and combat this issue. He also points to some disincentives that discourage physicians from being more involved in treating the obesity problem.

There is a definite lack of public recognition of childhood obesity as a chronic health condition and a widely held perception that obesity is a self-control issue. Some impediments to physicians helping to solve the issue are also the lack of funding from insurance agencies, the lack of time physicians have to devote to such a long-term health issue, and the lack of data available documenting the success of pediatricians in combating obesity (Riggs 1998, 1-16). Pediatricians are viewed by some researchers as potentially the best counselors and teachers in informing the public on the subject of combating childhood obesity (Fowler-Brown and Kahwati 2004, 8). They certainly should be part of the solution.

The Role of Advertising:

Some literature argues for public leaders to proselytize for healthy eating, much like Governor Mike Huckabee from Arkansas. After he was diagnosed with diabetes, he started exercising and eating well, and started the "Healthy Arkansas" crusade to make health promotion a priority in his state (Randolph 2006, 1-7). Bill Clinton has also made health a priority. He joined with the American Heart Association to start the Alliance for a Healthier Generation, aimed at keeping younger people healthier. One study found that a media campaign, encouraging consumers to shift from whole milk to low-fat milk, was successful in changing consumer purchases (Cawley 2006, 69-88). Initiatives such as these have been successful in changing consumer purchases to some degree but they must compete with billions of dollars worth of advertising by "big

food"[3]. Much of what they do is overshadowed by the advertising business. Additionally, many nutritional societies and organizations are sponsored by the food industry. This may signify a huge conflict of interest and potentially undermine the work carried out by the nutritional groups (Ebbeling, Pawlak, and Ludwig 2002, 473-483).

If the average child ate a diet that was directly proportional to the food advertising he or she is exposed to, it would consist of mostly high fat high sugar foods, and it would look much different from the diet recommended by the American Medical Association[4] (Cawley 2006, 69-88). In the United States, children are exposed to about ten food commercials for every hour of television they watch. These commercials are almost entirely for fast food, soft drinks, sweets, and sugar cereal. Furthermore, a study done on 3-5 year olds found that, after they were exposed to thirty-second food commercials, the children were more likely to pick the advertised food later on when presented with choices of what to eat (Ebbeling, Pawlak, and Ludwig 2002, 473-483). As we have seen from the information above, consumers do indeed change their eating patterns to some degree based on advertising.

During the time frame [the past 30 years] that obesity in children has more than doubled, advertising aimed at children has also doubled (Anderson and Butcher 2006, 19-45; Cawley 2006, 69-88). Frank B. Hu found that watching TV and other sedentary behaviors is positively correlated to the onset of obesity and diabetes (Hu and others 2003, 1785-1791). Another study, done by Cara Ebbeling, also found that children who

[3] I am using "big food" to denote the largest most powerful food companies in a similar way that "big tobacco was used to talk about the biggest most powerful tobacco companies.

[4] See appendix A

watched the most television tended to weigh the most (Ebbeling, Pawlak, and Ludwig 2002, 473-483). She also found that there is a negative association between the consumption of fruits and vegetables and eating a meal while watching television. Children who eat in front of the TV, on average, tend to have a less nutritious diet than children who do not.

A more quantitative study investigated the relationship between fast-food advertising and overweight adolescents. The study concludes that a ban on fast food advertisements would result in an 18% reduction in overweight 3-11 year olds in a fixed population and a 14% decrease in overweight 12-18 year olds (Chou, Rashad, and Grossman 2004). Food advertising is tax deductible; the researchers also looked at how the elimination of this tax break would affect the number of advertisements. They found that this change would result in a 54% increase in the cost of advertising. This in turn would have the expected effect of decreasing advertising aimed at children by 35%, and subsequently decrease obesity by 5-7% in a fix population of 3-19 year olds (Chou, Rashad, and Grossman 2004). It seems that television advertising has a negative impact on the health of children and perhaps there is adequate reason to ban or cut down on advertising to children. However, "big food" has powerful lobbyists that have thus far managed to ward off all threat of a child focused advertising ban or a reduction in the tax benefits to advertisers.

PepsiCo. and Coca-Cola generated 54 billion dollars in sales in 1998, and are expanding into younger and younger audiences. They are trying to establish brand loyalty as early in life as possible, even placing their logo on baby bottles(Nestle 2000, 308-319). The ties that school districts have with these companies give administrators

huge incentives to push the unhealthy products sold by the companies. “Elementary and secondary school children deserve some protection against commercial interests that contribute to poor nutrition” (Nestle 2000, 308-319).

Over the time frame that childhood obesity has increased rapidly, the amount of calorie-dense food and drinks available to children has also substantially increased (Anderson and Butcher 2006, 19-45). Almost all high school students have access to vending machines, 73% of schools have contracts with name brands in exchange for funding, and 63% receive a cut of the sales profits (Ulrich 2005, 10-13). Contracts such as these are referred to as “pouring rights” and focus on promoting unhealthy products to “young, impressionable, captive audiences”(Nestle 2000, 308-319). In 2002 the number of school districts with contracts with Pepsi or Coke was 180 in 33 states (Nestle 2000, 308-319). Numerous studies have conclusively correlated soda intake with obesity (Division of Nutrition 2007, 19). There is an estimated 10% greater calorie intake among children who drink soft drinks than those that do not (Ebbeling, Pawlak, and Ludwig 2002, 473-483). The consumption of soda leads to hundreds of “empty calories” a day. Children with regular intake of soda tend to have a significantly lower consumption of milk and fruit juice (Nestle 2000, 308-319).

The Role of Physical Activity:

As expected, levels of exercise are related to weight gain to some degree. Predictably, exercise is negatively correlated with obesity and diabetes. Even time a person spends simply standing combats both obesity and diabetes (Hu and others 2003, 1785-1791). Throughout the time period that childhood obesity has increased, children’s’ time spent in sedentary behaviors has also increased (Anderson and Butcher

2006, 19-45). The time children spend watching TV or playing video games is time they are not playing outdoors. The strongest correlate to children's activity level is the time they spend outside (Sallis and Glanz 2006, 89-108). Also, research has shown that the more access a person has to safe workout environments, the more they tend to exercise. This may just be because people who enjoy working out make sure to live in more workout- friendly areas, but it is not likely that this explains all of the correlation. Over the past twenty years the cost of exercise has gone up relative to the cost of consumption (Anderson and Butcher 2006, 19-45). The opportunity cost of exercising, or taking a child out to exercise, is the time that could be spent making additional wages at work. Since real wages have risen, the opportunity cost has also gone up, therefore decreasing incentives to exercise (Sallis and Glanz 2006, 89-108). Perhaps the government should think about giving tax credits to people who participate in health clubs or give incentives to neighborhoods to provide safe places for children to play.

Another possible contributor to childhood obesity is physical education (PE), or lack there of. Almost half of all high school students have no form of PE class taught at school (Ulrich 2005, 10-13). With No Child Left Behind now putting a great deal of additional financial strain on many public school districts, PE and similar programs are being cut from the curriculum. One study showed that a focus on "new-PE" or personal fitness, rather than the traditional physical education focus on competitive sports, would be much more effective in combating obesity and promoting health (Fowler-Brown and Kahwati 2004, 8). Physical education in schools is still an important teaching tool for good health, particularly certain types of PE teaching.

An increase in the number of households in which both parents work has possibly contributed to children being less physically active. If children are at home alone for a larger percentage of their day, there tends to be an increase in television viewing and other sedentary behaviors. Eberstadt states, "welfare reforms biggest effect on children is that they spend less time with their mothers and watch 22 more minutes of television [per day] on average" (Eberstadt 2003, 1-10). Many studies have found that there is a large correlation between mothers working and childhood obesity (Anderson and Butcher 2006, 19-45; Rabkin 2001, 81-91; Ulrich 2005, 10-13).

Consumption Trends:

The trend that has had the biggest effect on childhood obesity, as least based on the literature, is the change in eating habits that has occurred over the past 30 years. Between 1980 and 2005, the real price of food has fallen by 13%. This has not been the same across all types of food however. Between 1989 and 2005, the price of fruits and vegetables rose by 76%, while the price of fats and oils fell by 26.5%, and the price of sugars decreased by 33% (Cawley 2006, 69-88). Technology has allowed food to be processed at much lower prices and the use of appliances such as microwaves has become common in almost all American households, which was not the case 30 years ago. On average, the American diet is made up of 90% processed food, which tends to be much higher in both sugars and fats (Lin, Guthrie, and Frazao 2001, 8-17). Now that processed pre-made food is readily available, people are more likely to snack. With the estimated cause of weight gain at a mere 100-150 calorie increase per day, unhealthy snacking is likely a large component of the increase in weight (Cutler, Glaeser, and Shapiro 2003, 93-118).

As mentioned earlier, food subsidies also play into what Americans eat. As Richard Ackinson, the president of the American Obesity Association stated "there are a lot of subsidies for the two things that we should be limiting in our diet, which are sugar and fat, and there are not a lot of subsidies for broccoli and Brussels sprouts" (Fields 2004, A820-A823). The low cost of high fructose corn syrups and oils has led to increased consumption of products containing those ingredients rather than healthier fresh fruits and vegetables. Countries with fewer processed foods available to eat tend to be much less overweight than countries with a lot of processed food and subsidies on foods (Cawley 2006, 69-88; Cutler, Glaeser, and Shapiro 2003, 93-118).

One way to get rid of some of the food cost asymmetry would be to "tax the fat" or have government place taxes on foods considered to exacerbate obesity and health issues. Taxes on high fructose corn syrup, trans-fats, and saturated fats would help to discourage people from eating them; much like alcohol and tobacco taxes and help to pay for the negative externalities they create (Cawley 2006, 69-88; Randolph 2006, 1-7). Another possibility would be to subsidize healthy foods, or stop subsidizing unhealthy foods. This would be especially beneficial to lower income people who spend a greater percentage of their income on food, especially because the purchase of fresh fruits, vegetables, and lean meats increase food budgets by approximately 5,000% per calorie (Fields 2004, A820-A823).

Children are not eating enough fruits and vegetables. There is definite evidence that increased fruit and vegetable consumption leads to decreased instance of illness (Pentecost 2002, 46-62). Higher fruit and vegetable consumption is also correlated with higher academic achievement (Neumark-Sztainer and others 1996, 497-505). A study

done by Tom Baranowski, based on social cognitive theory, found that when more fruits and vegetables were available people were more likely to buy them. The increased availability of these products to children led them to eat more fruits and vegetables (Baranowski and others 2006, 280-291). Most consumers, when questioned about why they buy fruits and vegetables, responded that they grew up eating them. Another study by Karen Cullen and Tom Baranowski looked at students' likelihood of eating healthily when there were unhealthy snack bar options available as opposed to when there were not unhealthy options available. They found that fourth graders that did not have access to the snack bar at school ate more fruits and vegetables than fifth graders with access (Baranowski and others 2006, 280-291).

Children in the 1980's were only receiving 2% of their energy intake from fast food; today they get 10% from fast food and eat thirty percent of their meals outside the home. The average sized fast food meal has approximately 2200 calories and would take approximately a marathon's worth of running to burn off. Girls who eat fast food four or more times a week eat, on average, between 770 and 1095 calories more a day (Ebbeling, Pawlak, and Ludwig 2002, 473-483). With numbers like these it is clear that fast food contributes to weight gain.

An article by the National Bureau of Economic Research stated, "Through sponsorship of school programs, school lunches, and recreational facilities, the government can more easily and immediately affect the choices of children than adults" (Chou, Rashad, and Grossman 2004). Based on the literature available about childhood obesity this seems to be an accurate statement.

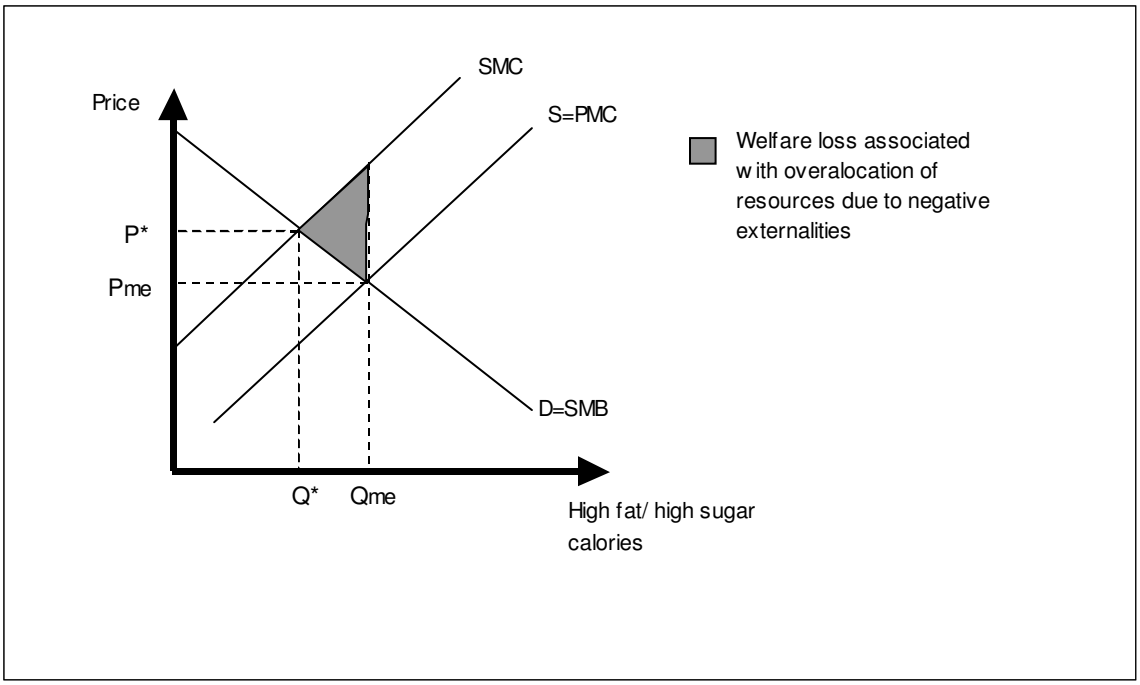
Market Failures:

Americans as a whole are fatter today than ever before. More than 60% of adults are overweight or obese, a number that has increased by more than 13% over the past twenty years (Rabkin 2001, 81-91). An even scarier number to think about is that over 17% of 2-19 year olds in the United States are overweight and obese. This number makes up almost one fifth of the entire population of children (Cawley 2006, 69-88). The vast majority of these children remain overweight and turn into an obese adults. The problem is becoming so pervasive that obesity is now the number two cause of preventable death in the United States and is estimated to surpass smoking [the number one cause] in the next few years (Anderson, Butcher, and Levine 2003, 30-48). There are a number of market and government failures associated with the vast number of obese children in America. I will highlight the most severe in the next few paragraphs.

Negative Externalities

The first market failure I will focus on is negative externalities. Not only is obesity an extensive problem but, the social costs associated with the problem are astronomical. Below, I have shown a visual image of how negative externalities have added to the problem:

Social Welfare Loss Associated With Negative Externalities



The model above shows the costs and benefits of "unhealthy food" or foods that are high in fat and sugar. The demand curve (D) for high sugar high fat foods is equal to the marginal benefit (SMB) that society derives from these foods. It also reflects what consumers are willing and able to pay. The supply of these foods is denoted by (S=PMC). The supply curve shows the market supply of high fat high sugar goods and reflects the firms Private Marginal Cost (PMC) of producing these foods. The Q_{me} and P_{me} reflect the equilibrium market quantity and price. The Social Marginal Cost line (SMC) represents the PMC plus the externalities associated with the high fat and sugar foods. Q* and P* denote what the equilibrium price and quantity of high fats and sugar foods should be if negative externalities were internalized.

The model shows that the cost of "unhealthy food" or foods that are high in fat and sugar, does not account for the negative effects of those foods on society. The producers of these goods do not need to take into account the costs of adverse health

issues and the psychological issues that result from overweight and obesity. These costs are not reflected in the price of these foods.

Studies estimate the direct cost of obesity to be between forty-five and sixty-one billion dollars. The indirect costs such as lost wages due to failure to work, sick days, or premature death, add on an additional fifty-six billion dollars (Anderson and Butcher 2006,19-45; Division of Nutrition 2007, 19). Also, overweight and obese individuals, especially females, tend to earn lower wages. This could be due to lower productivity, or discrimination, or a combination or both (Anderson, Butcher, and Levine 2003, 30-48; Averett and Korenman 1996, 304-330; Cawley 2006, 69-88). Many of these external costs are born by the public through tax contributions to Medicare and Medicaid.

Studies estimate that 33-100 billion dollars is spent per year on dieting and dieting-related goods; these numbers are equivalent to about the GDP of Egypt or Hungary (Averett and Korenman 1996, 304-330; Cutler, Glaeser, and Shapiro 2003, 93-118)! There are social and psychological pressures and stigmas that induce both a fear of weight gain and a habitual stereotype of obese people. These could also be viewed as negative externalities.

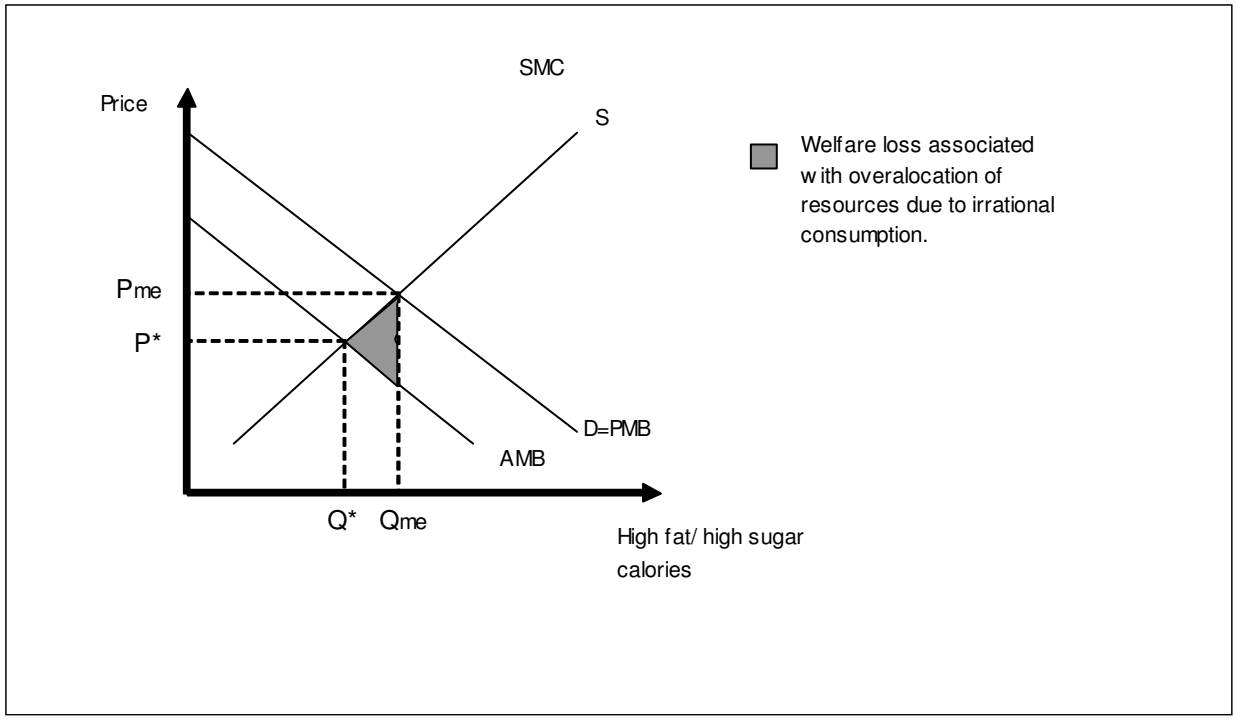
Given the already stated eighty percent of overweight children that become overweight adults, it seems clear that childhood obesity is an apparent indicator for weight and health later in life. As mentioned above, the younger a person is when they become obese, the more likely and severe their health problems are expected to be as they get older (Koplan M.D., M.P.H., Jeffrey P. and Brownson, Ph.D., Ross C. 2004, 2).

The negative externalities associated with childhood obesity result in an over allocation of society's scarce resources into the production of foods that are high in fat and sugar. This social welfare loss is depicted by the grey triangle on the graph.

Childhood Irrationality

The second market failure I will discus is rationality. As mentioned earlier, in economics there is an assumption of childhood irrationality (Cawley 2006, 69-88). Below I have shown how this may affect children's diets.

Social Welfare Loss Associated With Irrational Consumption



The Private Marginal Benefit line (D=PMB) denotes the demand a child might have for perhaps a candy bar, given that they are not rational and have not taken the negative health and weight consequences into account. The supply curve (S) denotes

the supply of the high sugar and fat foods at different prices (ceteris paribus). Q_{me} and P_{me} illustrate the equilibrium price and quantity of high fat and sugar foods.

The AMB line denotes the Actual Marginal Benefit that children accrue from eating the candy bar or other high sugar or high fat food. The AMB takes into account the things children may not consider: the crash that may come after consumption of caffeine, the sugar high that may hinder paying attention in class, or the hunger a child may feel an hour or two after lunch is over because they bought cookies rather than more substantial food. The P* and Q* denote what the equilibrium price and quantity of high sugar and high fat foods would be if children were more rational consumers.

There is a welfare loss associated with the childhood inability to act as a rational consumer, and the perception held by many children that their benefit from these foods is greater than it actually is. The grey triangle denotes the social welfare loss associated with over-allocating society's scarce resources to the production of foods high in sugar and fat. This market failure to some degree also supports the opinion that the government is justified in formulating public policy measures to reduce childhood obesity.

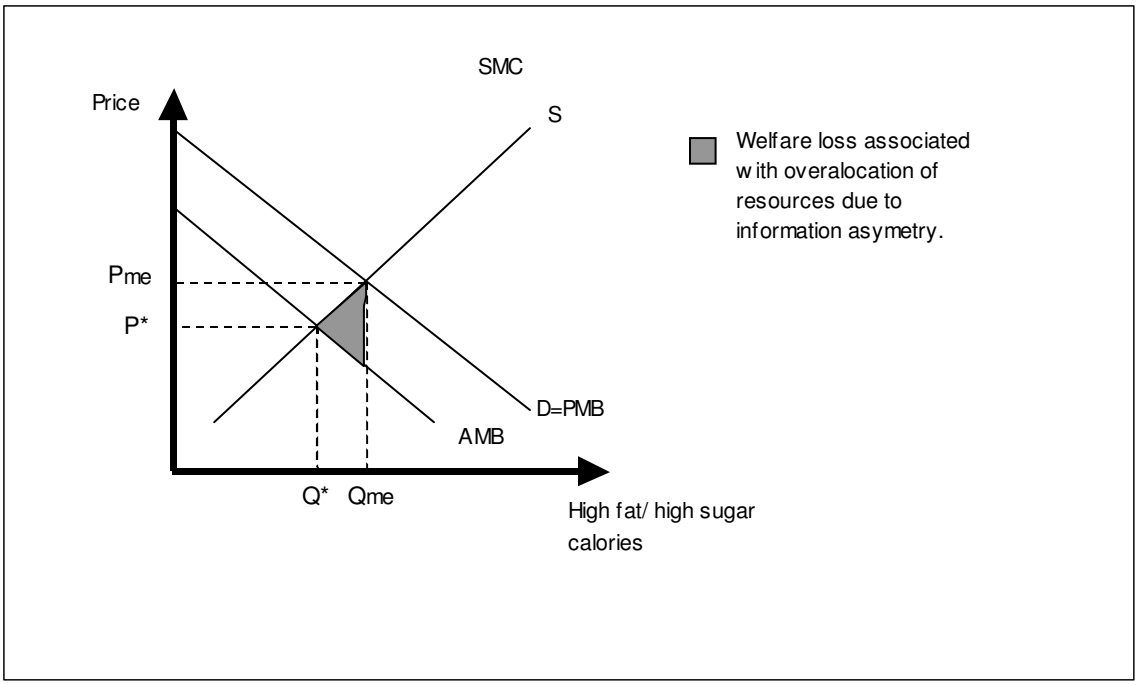
However, there is still some suggestion that all people are, to some degree, irrational when it comes to food consumption (Cawley 2006, 69-88). It is difficult for humans to properly assess the risk of low-probability events, such as the negative effects of one additional gram of fat. Also, there is the issue of time preference and the satisfaction derived from eating one cheeseburger right now versus the satisfaction of a lower weight a few weeks from now (Milam, Garrett 2007). Although these are valid and interesting arguments, for the sake of this article I will assume, like Economist

Kamhon Kan, that adults are at least partially rational when it comes to eating (Kan and Tsai 2004, 907-934). Most adults at least consider the negative consequences of "unhealthy" eating even if they still choose to eat that way. However, I will still assume that children are not rational and cannot weigh the future consequences of their actions. I feel that this assumption is justified by many other ways in which our society restricts children, through age limits on driving, drinking, and the consumption of cigarettes.

Information Asymmetry

The third market failure I will discuss is that in a free-market system producers tend to under-provide information to consumers (Cawley 2006, 69-88). This has led to a failure in the form of imperfect information and has also intensified the problem of obesity. Below is a graph that visualizes the problem:

Social Welfare Loss Associated With Information Asymmetry



This graph is identical in appearance to the childhood irrationality graph. The key difference is the reason for the market failure. In this case the D=PMB is the amount of high-fat and high-sugar foods actually demanded given the information a consumer has. The AMB line denotes the actual marginal benefit a person derives from the high sugar high fat foods. The vertical distance between the two lines is the difference between the PMB of consuming high sugar high fat foods and thus what they are willing and able to pay for these goods, and what the AMB is. This difference is due to the information that consumers lack about the food they consume. A consumer may think that a certain food is low in sugar and fat because they do not have the nutritional information about the food, and thus decide to eat more of the food than they would if they knew the nutritional information.

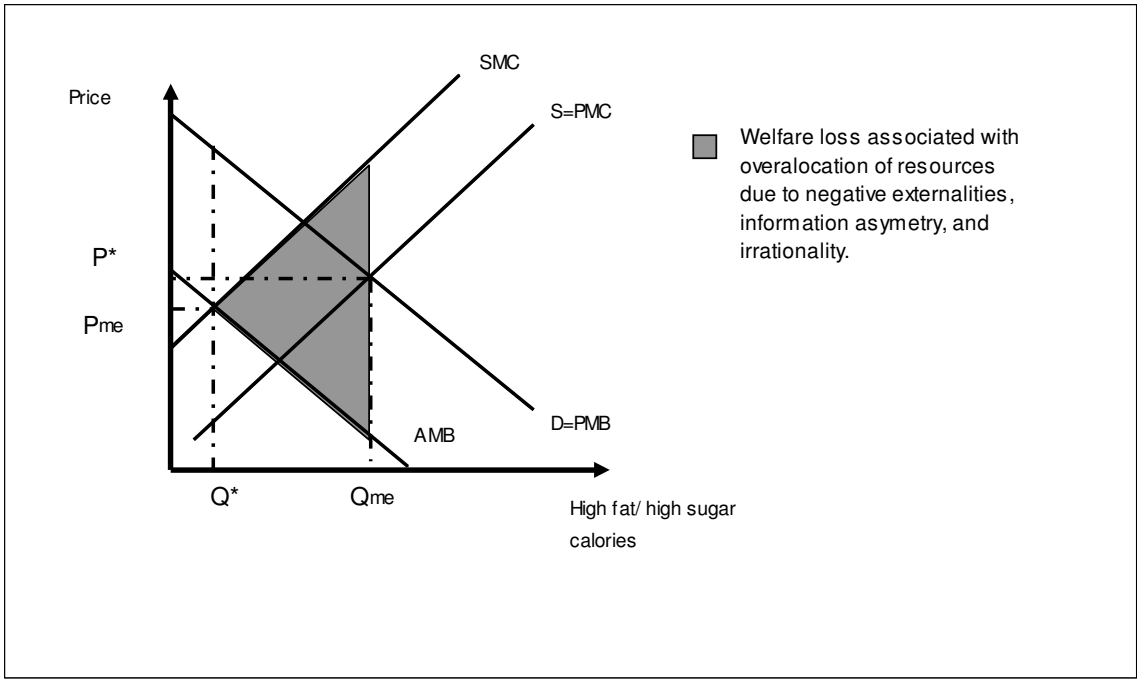
If people do not have the information to determine the degree to which the food they eat is harmful, they are likely to have a higher demand for goods that may have adverse affects on their health. This leads to an over allocation of resources to foods that

are high in fats and sugars. Now that people consume over thirty percent of meals outside of the home, misinformation is especially problematic. This is added justification for intervention measures. The social welfare loss associated with over-allocating society's scares resources to the production of high-fat and high-sugar foods, as a result of the lack of information, is denoted by the grey triangle on the graph.

Market Failures Combined

All of the graphs were strikingly similar and all three market failures led to the over allocation of resources to high-sugar and high-fat foods. When considering the problem multiplied by the three, the over allocation becomes even more pronounced than with each individual graph.

Combined Market Failure Graphs

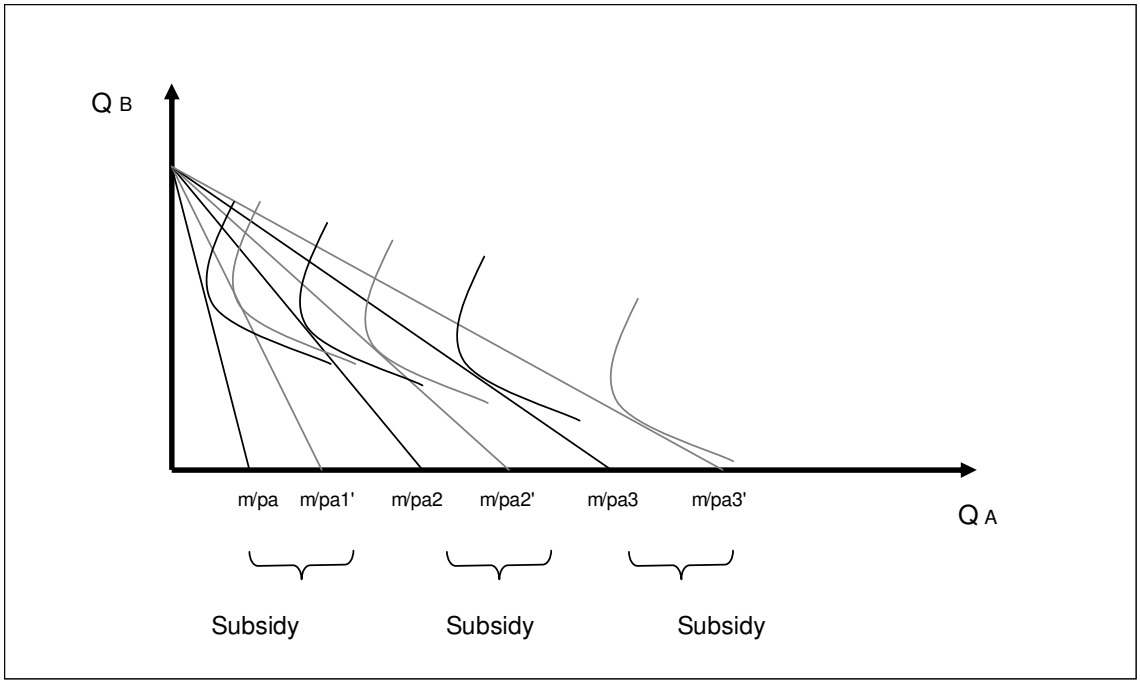


In this graph the social marginal cost (SMC) curve and the actual marginal benefit (AMB) curves determine the optimal quantity (Q*). It is clear that the amount being produced (Q_{me}) is much greater than what would be optimal (Q*). The large grey triangle denotes the social welfare loss caused by the over allocation of resources to the high fat high sugar foods.

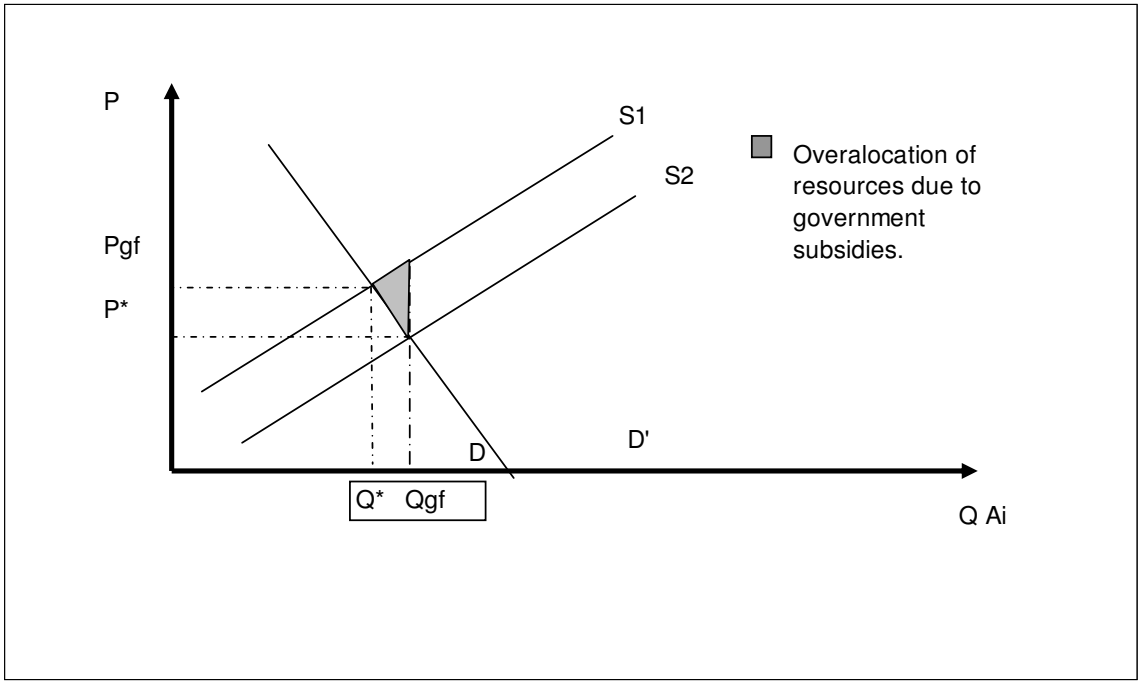
Government Failure

Eating more energy-dense foods and expending fewer calories causes weight gain. One study, used to determine why Americans eat as they do, found that cost was ranked second right after taste, any factors that influence a persons eating decisions (Sallis and Glanz 2006, 89-108). This implies that there may be some government failures associated with obesity as well. Indifference curves for different foods at different prices determine a person's individual demand curve for that good. If cost is one of the main determinants of food choice, then the indifference curves will be skewed towards low cost food options, thus making the demand for these goods especially high.

Budget Constraint and Utility Maximization for Good A and Good B



Effect of Subsidies on the Demand for a Good



The first graph shows utility maximization curves subject to cost constraints for good A and good B. In order to figure out the maximum quantity of a good a person

can buy given their budget, you divide their budget (m) by the price of the good (P_A). M/P_{A1} on the graph denotes the cost constraint given a higher price of good A. m/P_{A2} is the amount of A that can be bought given a medium price of good A and m/P_{A3} is the amount of good A that can be bought when the least expensive price of good A shown. The person's budget remains constant. These same values with a prime symbol denote the greater amount of good A the person can buy when the government subsidizes part of the cost of A. The distance between m/P_{A1} and m/P_{A1}' shows the increased quantity of good A the person can buy (if he were to use all of his income on the consumption of A) thanks to the subsidy.

In this example the government subsidizes good A but not good B; the budget (m) and the price of good B are kept constant throughout the model as is the amount of the subsidy. In the graph the cost constraints that include a subsidy are reflected by the lighter grey budget constraint lines. The subsidy makes good A cheaper than usual at every price, so the budget constraint extends farther for every $m/P_{A(x)}$'.

The next graph, which is derived using the first graph, shows how the subsidy causes a skewed supply of good A. The supply of good A [high-fat and high-sugar foods] is higher than it would naturally be without government intervention because of subsidies, which cause the firm to have lower production costs, thus causing a social welfare loss due to over allocation of society's scarce resources.

The price gap between fruits and vegetables and high-sugar high-fat foods is artificially large in the United States. Less than one tenth of one percent of the budget for food subsidies is put into fruits and vegetables, while the rest goes to the production of foods that are easily converted into high-sugar and high-fat products such as corn and

soy (Fields 2004, A820-A823). This means that quantities consumers demand for these goods are also artificially high. Thus, agricultural subsidies cause a government failure in the form of over allocation of resources to high sugar high fat foods.

The development of high fructose corn syrup has further skewed the costs of processed foods by making it possible to sell 25-cent snack cakes and 60-cent candy bars (Fields 2004, A820-A823). A farmer is more likely to produce mass quantities of subsidized foods rather than fruits and vegetables because the profitability associated with the production of the fruits and vegetables is much lower. Unhealthy foods are the "best buy" and are downright cheap, even to a middle-income consumer thereby giving an even greater incentive to consume more unhealthy food for less. This government failure further magnifies the social welfare loss associated with the over allocation of resources to unhealthy foods.

Political Economy:

Powerful Corporations

If childhood obesity truly is an epidemic in the United States, why have policy makers not made more changes to try to fix the problem? The book *Food Wars* effectively describes the problem by saying that "Food Policy, once focused on farming and culture, is now dominated by consumption as dictated by the triumvirate of manufacturers, retailers, and food service providers"(Fried 2005, 966-977). Food is big business. Everyone has to eat and there are large profits to be had from selling processed goods.

Manufacturers like Coca-Cola, PepsiCo., Kraft, and General Mills want to continue to make large profits on food consumption. In order to ensure that this continues to be possible they spend a lot of money in Washington DC giving campaign contributions and forming powerful lobby groups. The same is true of many advertising agencies and large grocery chains and restaurants, particularly fast food establishments. There actually is a lobbyist group, the Center for Consumer Freedom, which argues against what they dub the "food Nazi's", or groups that try to restrict advertising or regulate eating in any way (Guthman 2006, 427-448). Basically, they oppose any government action that might restrict these large food companies in any way by claiming that it will infringe on consumer rights.

Many large food corporations put a lot of money into sponsoring kids sporting events and community functions to portray a "good guy" image. They also make a good number of campaign contributions and pay lobbyist groups to promote their best interests as mentioned above. These companies have the money to spend on developing and maintaining a positive image and remaining powerful.

One of the solutions to childhood obesity mentioned in the literature review was to tax high-fat and high-sugar food. One of the main impediments to implementing a policy such as taxing fat is the powerful presence that "big food" has in communities and governments on both a local and federal level.

Advertising

Most large food corporations have extensively studied the effects of advertising to children. They would not put billions of dollars into the industry if they did not believe with almost absolute certainty that it would increase their sales. Most parents do not realize how effective advertising is in the development of their children's eating habits. The vast majority of parents do not spend time looking over experiments on child psychology in relation to advertising as many corporations and advertising agencies do. The large corporations have a lot of political clout. Without a consumer outcry from voting members of communities, politicians are not likely to alienate large corporate donors by banning advertising to children, or even restricting these companies' tax benefits. There is not likely to be an outcry unless parents become convinced of the harm that can be caused by advertising to children

Even the government actively participates in advertising in a discriminatory manner. It funds large advertising campaigns or checkoff programs aimed at encouraging consumers to buy certain goods. The government does this to decrease the surplus of many agricultural goods such as milk, cheese, and meats but not for vegetables and fruits. Researcher Noel Blisard, found that checkoff-funded programs such as the "got milk?" campaign, "Ahh, the power of Cheese," and "Beef-It's what's for dinner," in net terms, increased the sale of the commodities being promoted by a statistically significant amount (Cawley 2006, 69-88).

The government support for agriculture through advertising programs such as checkoff programs and subsidies are good for agricultural companies but may not be in the best interests of the average consumer. The symbiotic relationship between the

government and agriculture is one that is ingrained in our society and will be very difficult to change.

Politics and Schools

The government has been very lax in regulating contracts made between primary schools and "big food" companies. It is not possible to address this problem without recognizing the propensity of the US government to grossly under-fund public education (Guthman 2006, 427-448). Allowing big food corporations to make contracts with schools increases school funding, but at what cost?

Politics affect schools in other ways as well. As mentioned earlier, many classes, including PE have been cut from the students' curriculum due to lack of funding. The government-backed No Child Left Behind, although good on paper, has many negative side effects, such as ignoring many of the needs of children that go beyond pure math and science education. In Taiwan, a study was completed determining the relationship between unhealthful eating and unfavorable school performance. It found that the two had a positive relationship. Children with poor nutrition did not achieve at the same level as those with good nutrition. More particularly, students with low levels of iodine or zinc had a marked improvement in cognitive ability and IQ after taking a supplementary pill. Also, children who did not eat breakfast were found to have a shorter attention span, lower grades in mathematics, and worse attendance (Mangunkusumo and others 2007, 273-279). Although health and weight are not synonymous, they tend to be related.

No Child Left Behind has inadvertently taken funding away from programs such as healthy eating, sports, and music. Programs that give school funding with strings attached, coupled with an overall decrease in government support for public education, have led to a need for alternative funding. However, contracts with large food companies, that encourage students to eat high-sugar and high-fat foods during school, undermine the very things that No Child Left Behind and similar programs are trying to accomplish.

Politicians and Policy Makers

As Michael Berman warns "even the best anti-obesity programs won't produce the gratification that politicians like best: quick results" (Tumulty 2006, 40-43). This is another hurdle in the way of a national push for change in the way the childhood obesity problem is handled. Politicians have a tendency of coming up with simplistic responses to complex problems because of their desire for quick fixes. This idea was evident in No Child Left Behind, Checkoff Funded Programs, and many other government "solutions" to problems. Given the restrictions on policy changes, due to the political climate surrounding "big food" I argue that other changes may be easier to implement particularly in the short run.

Role of Tastes and Preferences:

Reasoning

After becoming familiar with the literature on childhood obesity and looking at the political economy surrounding the food industry, I have concluded that, although many of the school-based programs have not been successful, an education-based approach to combating childhood obesity is still the most practicable and fundamental reform necessary. It is also the best venue to combat the market failures associated with childhood obesity.

Education levels are negatively correlated to adult obesity especially among females (Cutler, Glaeser, and Shapiro 2003, 93-118). This implies that education is, to some degree, in and of itself a preventative measure. I additionally propose that the tastes and preferences that determine consumption patterns are to a large degree formulated as a child, so the school years are especially crucial. Moreover, there is a lot of evidence that suggests that children, even as young as two years of age, formulate many of their food preferences based on their peers preferences (Lumeng 2005, 13-19). From a biological standpoint this makes sense, a young child's nutritional requirements are most similar to those of other young children. Foods that might be fine for an adult to consume may not be the best option for a child (e.g. alcohol, un-pasteurized foods, sushi) thus, they often imitate what other children eat (Lumeng 2005, 13-19). This further supports the idea that schools provide an excellent arena to teach health practices and that they may be more effective because schooling occurs earlier in a persons' lifetime.

Preferences

One study showed how preschoolers can affect each others eating habits (Birch and Fischer 1998, 539-549). When a child, who disliked a particular vegetable, was put in an environment with children who liked that vegetable, the child that previously disliked the vegetable increased his or her intake and preference for the vegetable (Birch and Fischer 1998, 539-549). The simple act of the child observing her peers made her more likely to try the vegetable. This result was seen over and over again and supports the idea that a school environment is optimal for teaching good nutrition habits.

Children are not predisposed to want to try new foods, especially not vegetables. It takes time for them to make associations between food flavors and the post-ingestive results of eating (Birch and Fischer 1998, 539-549). Child feeding practices have the potential to modify a child's patterns of intake and therefore affect their energy intake. Birch and Fisher have found that the only significant predictor of fruit and vegetable intake were a child's preferences for those foods. Altering a child's food preferences therefore should be the most effective way of achieving a better nutritional balance of foods eaten (Birch and Fischer 1998, 539-549).

A study done by Birch established one method of altering food preferences. By repeatedly exposing children to small portions of a food; through encouraging them to try a little bit every day or every few days, their taste for the food can change. Children sometimes have to be exposed to the food up to 15 times for it to become familiar and preferred but results showed that it was possible (Birch, Marlin, and Rotter 1984, 431-439). Another study, that supports this theory, showed that a reduction in total sodium intake, over a period of time, lowers the preference of salt in familiar foods. It also

showed a decreased preference for salty foods (Cooke 2007, 294-301). In general the study showed that a person's preferences for sugar and salt are modified by experience.

Children tend to mimic their parents in eating, especially their mothers, so some eating habits are undoubtedly formulated prior to a child being of school or pre-school age. However, it would be more difficult to encourage parents to change their eating habits and eat healthily than to attempt to change preferences of younger children. Additionally, the habit of strongly controlling what a child eats can impede their ability to make personal eating choices later on. A child needs to be given adequate leeway to develop self-regulatory behavior in their eating practices (Birch and Fischer 1998, 539-549). Perhaps in a school environment this can be accomplished even if the child faces stricter rules at home.

Many parents, teachers, and other adults use contingency eating to convince children to act in a certain way. For example a parent may allow a child to eat Pop Tarts for breakfast if they wake up and get ready for school on time, or they may tell the child that he or she may not go out to play until finishing their carrots. Teachers may give children candy for answering a question correctly. In a study done at the University of Illinois, it was found that these types of contingency eating deals affect the way in which the child views the food used. In the case of using food as bribery, an increased preference for the food was established. When food was used in a reverse manner, as something that must be eaten before the child could go play, then negative perceptions about that particular food were formed (Birch, Marlin, and Rotter 1984, 431-439). This may mean that bribing, at least in the educational arena, should be decreased to a

minimum or that fruits and vegetables should be used as the bribe rather than candy bars or chips.

In Taiwan a study found that the level of food intake for both low quality and high quality foods was related to the children's' food preferences. Students who ate the more unhealthy food [low quality] consumed fewer vegetables and fruits (Mangunkusumo and others 2007, 273-279). The results from these studies are consistent with my hypothesis that tastes and preferences are formulated early and affect eating habits.

School Programs:

As mentioned above school programs have the potential to combat the problem of childhood obesity and decrease the instance of market failures. Two programs that have been successful in combating childhood obesity are the *Food Dudes* program in Scotland and the *Color me Healthy* program based out of North Carolina.

Food Dudes

The *Food Dudes* program uses cartoon superhero characters that are the same age as the children they are trying to teach. The characters get their powers from different fruits and vegetables and have to fight their evil nemesis the "junkies" [unhealthy food]. The program uses repetitive tasting of fruits and vegetables along with the persuasive characters to encourage children to try the new foods. This repeated exposure of fruits and vegetables coupled with nutritional information that the children are being taught has been successful in increasing the fruit and vegetable intake of the students involved in the

program. The program has also increased their enjoyment and preference for these foods. The program developers did a lot of research into the development of children's food likes and dislikes and whom they use as role models. This research seems to have paid off in developing an effective approach for a successful program.

The program also incorporates parents by giving the children Food Dude containers to bring fruits and vegetables to school in. Parents also get newsletters and there is a section on the school website for healthy recipes and suggestions for encouraging healthy family mealtimes. As additional support there is an information section about all of the benefits your child will get from healthy eating and a healthy lifestyle.

After twelve months of participating in the *Food Dudes* program the students showed a significant increase in access to fruits and vegetables, and consumption of these goods. By having repeated exposure to certain fruits and vegetables the students increased their preference for these foods. Also, the use of cartoon characters that the children could relate too and view as "peers" encouraged them listen to the cartoon characters more. It was found that the program works particularly well for the poorest eaters. This is a valuable aspect because poor eaters are the ones who most need the assistance (Lowe 2007, 14).

Color Me Healthy

The *Color Me Healthy* program is another school-based nutrition curriculum, but one that is based in North Carolina. Ten other states now use the program including Washington State. This program focuses on 4-5 year olds and uses an exploration of the

five senses to teach children to eat and enjoy healthy food and physical activity. Many preschools, daycares, Head Start Classrooms, and Kindergarten classes use this program.

The program comes with a kit that includes everything the teacher will need. There are six imaginary "trips" that the students can go on during learning time, plenty of colorful flashcards with age-specific information about healthy food and where to get it, seven catchy songs about healthy eating, and large posters to reinforce lessons. The program also promotes healthy snack times to taste and enjoy fruits and vegetables. The program encourages the day care provider to be a role model for the children and includes information about healthy eating and lifestyles for them as well. Additionally, there are fourteen newsletters for the children to take home to their parents.

More than 4,500 childcare providers have been trained to use *Color Me Healthy*. Of those, about half were surveyed and more than 90% have been actively using the program in their classroom. The providers responded that the program increased the healthy eating and physical activity of their students and that the students were much more aware of healthy eating practices [90%increased their ability to recognize certain fruits and vegetables] (Dunn 2006, 5).

This program and others in the United States might gain from implementing some aspects of the *Food Dudes* program. The *Food Dudes* program incorporates many different studies on how children respond to different stimuli and has been exceptionally successful in improving the eating habits of its participants. The *Color Me Healthy* program might have a greater effect on childrens' preferences for fruits and vegetables if it used more repetition in tasting. Also, because children are so influenced by their peers,

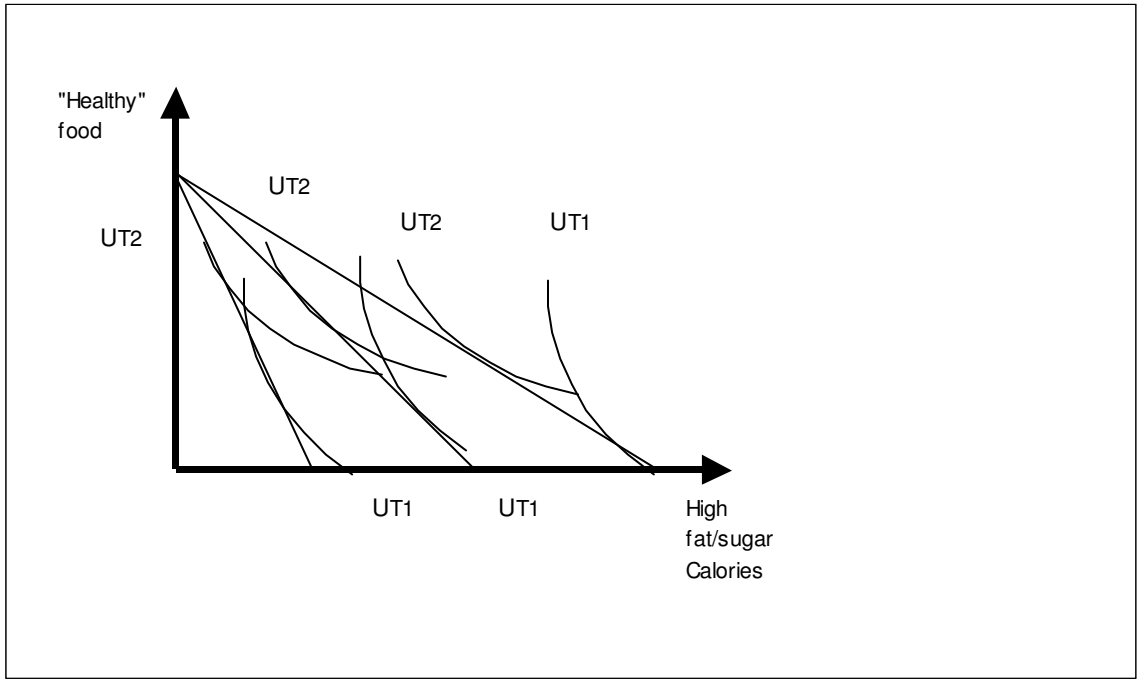
it might be a good idea for the *Color Me Healthy* program to try to incorporate that as well.

Recommendations:

Primary Recommendation

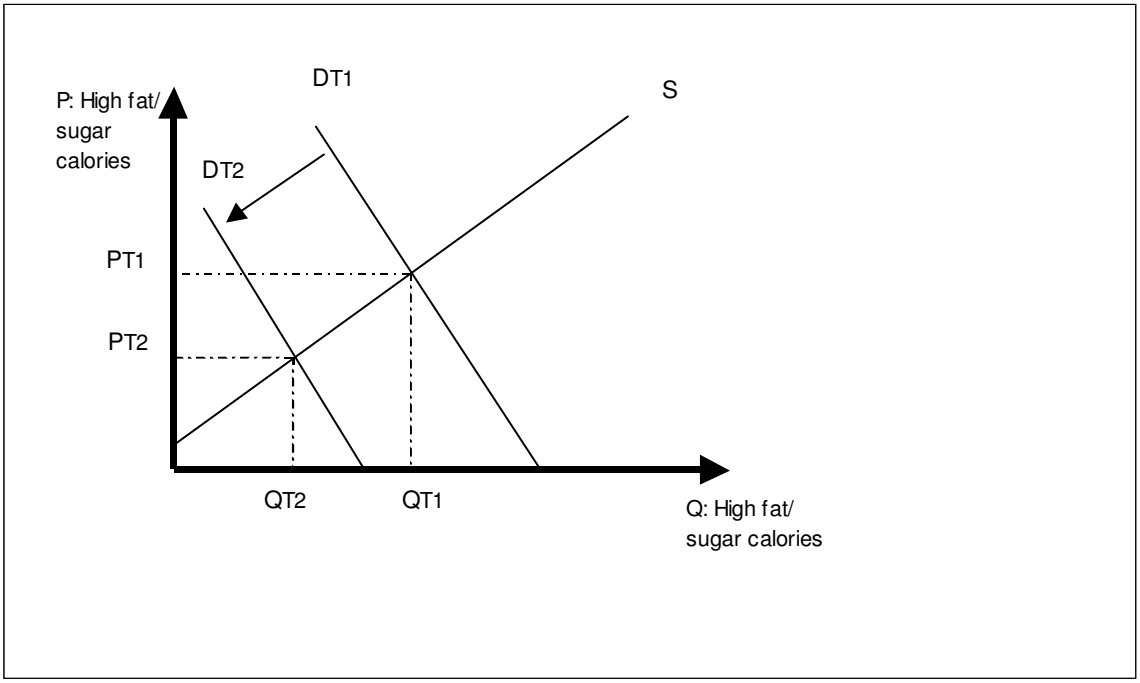
Even without a change in political economy, school programs such as *Food Dudes* and *Color me Healthy* can mitigate the market failures associated with childhood obesity. Imperfect information is lessened by the information that the children are taught about healthy eating and nutrition. Children are better able to make informed decisions about what to eat, so the social welfare loss associated with lack of information should shrink to some degree. Childhood irrationality is less important if children have a preference for "healthy" food. When children enjoy the taste of fruits and vegetables they are more likely to choose to eat them. This can be shown using the graphs below.

Change in Utility Slopes due to a Change in Tastes and Preferences



This graph shows that a child who originally had an indifference curve that was steeply sloped like U_{T1} would prefer foods with high-fat and high-sugar content. After being exposed to fruits and vegetables repetitively, by going through a program such as *Food Dudes*, the slope of many childrens' indifference curves would change, as their tastes and preferences changed. At each price level their individual demand for high-fat and high-sugar foods would be lessened by their increased taste and preference for fruits, vegetables, and other "healthy" foods. This is depicted by the U_{T2} indifference curves on the graph. Since individual tastes and preferences determine a person's demand for a good, the graph below is derived from the above graph.

Effect of Utility Slope on Quantity Demanded



In this graph D_{T1} is the original demand curve and is derived from the U_{T1} utility curves that were more steeply oriented towards higher quantities of high-fat and high-sugar foods. As the person's preference for vegetables, fruits, and other "healthy" foods increases, their relative preference for high-fat and high-sugar foods decreases, causing a shift in the demand curve. The D_{T2} demand curve is derived from the U_{T2} utility curves that are now sloped less steeply towards high-fat and high-sugar foods. If the supply (S) curve stays constant than the D_{T2} curve results in a lower quantity of high-fat and high-sugar foods at the equilibrium price and quantity (Q_{T2}, P_{T2}).

If a program such as Food Dudes were able to change the tastes and preferences for enough children than the demand curve for the market would shift, similar to the individual demand curve, and this would cause a decrease in the social welfare loss caused by the market failures.

If school programs can generate positive results and children continue to eat more healthfully, they will be less likely to acquire diseases associated with obesity. The earlier a child begins to learn healthy practices, the less likely he or she is to be a sick or obese adult. An increased number of healthy children can result in an increased number of those children becoming healthy adults. This would result in a lower healthcare burden on society. Also, as many studies show, healthy children who eat well are happier and perform better in school, they have higher self-esteem, and in the future they will be more productive. These positive effects of healthy eating and exercise practices will lessen the negative externalities of high-sugar high-fat foods. Also, the lower numbers of people who prefer high-sugar high-fat foods will lessen the impact of negative externalities.

Secondary Recommendations

In the long run school programs should be augmented by other changes such as federal laws requiring more transparency in nutrition information, restrictions on advertising to children, and perhaps a government tax on certain foods.

After children are taught about nutrition they are better able to read and understand nutritional labels and make even more informed decisions about what to eat. It would be a good idea in the future to require all restaurants and fast food venues to post the nutrition content of their foods. It should be accessible to anyone over the internet and in the different store locations. This is especially important when considering that almost a third of all meals are eaten outside the home.

It seems as though advertising, aimed at promoting unhealthy foods to children, to some extent counteracts the school nutrition programs. Subsequently, another important future step, in combating childhood obesity, is to ban advertising aimed at children or as a minimum discontinue the tax breaks associated with this type of advertising. This way, children will not be exposed to as much misinformation about what to eat. Additionally, the positive influences of the school programs may have a more lasting effect. The *Food Dudes* program in Wales coincided with a countrywide ban on advertising to children. The country has seen significant improvements in childrens' health through the combination of these two things.

Historically taxes have been a successful way to discourage consumption. The United States taxes cigarettes and alcohol and maybe should think about taxing foods with high-fat and/or high-sugar content in order to discourage the consumption of these goods. The justification being that society bears some of cost of these goods in the form of negative externalities. The tax should be equivalent to the negative externalities. One problem is that externalities are difficult to quantify and so the tax may not reflect the actual external costs.

Conclusion:

There are many different causes of the childhood obesity epidemic that has developed in the United States over the past 30 years. A number of market and government failures have contributed to the obesity problem and an associated social welfare loss results from the over allocation of society's scarce resources to foods that are high in fat and sugar. It is clear that childhood obesity is not a completely individualized

problem, particularly given that society must bear much of the cost. Public policy intervention is clearly appropriate. As I have shown, childhood obesity is a multifaceted problem with many contributing factors. Although there are many areas in which improvements can be made, given the political climate surrounding "big food" in the United States, education is ultimately the most practicable area for effecting change.

There are existing school based programs that have been successful in combating the childhood obesity problem such as *Food Dudes* and *Color Me Healthy*. These programs can effectively counteract some of the market failures associated with childhood obesity. The programs help to lessen the social welfare losses associated with the market and government failures and even foster positive externalities in the form of students' greater ability to learn and be productive members of society. In the future other reforms may also be necessary such as greater availability of nutrition information, a ban or restriction on advertising to children, and a tax on high-sugar and/or high-fat foods.

Society bears much of the cost of obesity through higher healthcare costs due to the comorbidities associated with obesity. Given the current healthcare crisis, the United States can not afford to ignore the obesity trend. Although cost effectiveness and cost-benefit analysis of the school-based programs was beyond the scope of this thesis, both analyses would be valuable future research to pursue. If future investigation found these programs or similar ones to be cost effective, then perhaps the United States should pass legislation making them mandatory in schools.

Bibliography

Anderson, Patricia M. and Kristin F. Butcher. "Childhood Obesity: Trends and Potential Causes." *The Future of Children* 16, no. 1 (2006): 19-19-45, links.jstor.org/sici?sici=1054-8289%28200621%2916... (accessed 9/22/2007).

Anderson, Patricia M., Kristin F. Butcher, and Phillip B. Levine. "Economic Perspectives on Childhood Obesity." *Economic Perspectives: A Review from the Federal Reserve Bank of Chicago* 27, no. 3 (2003): 30-30-48.

Averett, Susan and Sanders Korenman. ""the Economic Reality of the Beauty Myth"." *The Journal of Human Resources* 31, no. 2 (1996): 304-304-330.

Baranowski, Tom, Kathy Watson, Mariam Missaghian, Alison Broadfoot, Janice Barinowski, Karen Cullen, Theresa Nicklas, Jennifer Fisher, and Sharon O'Donnell. "Parent Outcome Expectancies for Purchasingfruit and Vegetables: A Validation." *Public Health Nutrition* 10, no. 3 (2006): 280-280-291.

Birch, Leann L. and Jennifer O. Fischer. "Development of Eating Behaviors among Children and Adolescents." *Pediatrics* 101, no. 3 (1998): 539-539-549, http://pediatrics.aappublications.org/cgi/content/full/101/3/S1/539 (accessed November 3, 2007).

Birch, Leann L., Diane Marlin, and Julie Rotter. "Eating as the "Means" Activity in a Contingency: Effects on Young Children's Food Preferences." *Child Development* 55, no. 2 (1984): 431-431-439.

Cawley, John. "Contingent Valuation Analysis of Willingness to Pay to Reduce Childhood Obesity." *NBER Working Paper Series* 12510, (September, 2006): 1-1-29, www.nber.org/papers/w12510 (accessed 9/7/2007).

———. "Markets and Childhood Obesity Policy." *The Future of Children* 16, no. 1 (2006): 69-69-88, links.jstor.org/sici?sici=1054-8289%28200621%2916%3A1%3C69%3AMACOP%3E2.0.CO%3B2-4 (accessed 9/22/2007).

Chou, Shin-Yi, Inas Rashad, and Michael Grossman. *Fast-Food Restaurant Advertisingon Television and its Influence on Childhood Obesity*. National Bureau of Economic Research. Vol. 1R01 DK548262004, http://www.nber.org/papers/w11879 (accessed 9/9/2007).

Cooke, L. "The Importance of Exposure for Healthy Eating in Childhood: A Review." *Journal of Human Nutrition and Dietics* 20, no. 4 (2007): 294-294-301.

Cutler, David M., Edward L. Glaeser, and Jesse M. Shapiro. "Why have Americans Become More Obese?" *The Journal of Economic Perspectives* 17, no. 3 (2003): 93-93-118, links.jstor.org/sici?sici=0895-3309%28200322%2917%3C93%3A3... (accessed 9/22/2007).

Division of Nutrition. "Obesity and Overweight." Center for Disease Control. www.cdc.gov (accessed 9/8, 2007).

Dunn, Caroline. "Color Me Healthy." Eat Smart, Move More NC. www.colormehealthy.com/professional/index.html (accessed 11/10, 2007).

Ebbeling, Cara B., Dorota B. Pawlak, and David S. Ludwig. "Childhood Obesity: Public-Health Crisis, Common Sense Cure." *Lancet* 360, no. 9331 (2002): 473-473-483, web.ebscohost.com/ehost/delivery?vid=7&hid=12&sid=4D444317-d992-4ca6... (accessed 9/12/2007).

Eberstadt, Mary. "The Child-Fat Problem." *The Hoover Institution Policy Review* no. 117 (Febuary and March, 2003): 1-1-10, http://www.hoover.org/publications/policyreview/3449856.html.

Fields, Scott. "The Fat of the Land: Do Agricultural Subsidies Foster Poor Health?" *Environmental Health Perspectives* 112, no. 14 (2004): A820-A820-A823, www.jstor.org (accessed 9/26/2007).

Fowler-Brown, Angela and Kahwati, Leila C. "Prevention and Treatment of Overweight in Children and Adolescents." American Academy of Family Physicians. www.aafp.prg/afp2007).

Fried, Ellen J. "Review Essay." *Journal of Health Politics, Policy and Law* 30, no. 5 (October, 2005): 966-966-977.

Guthman, Julie. "Embodying Neoliberalism; Economy, Culture, and the Politics of Fat." *Environment and Planning* 24, no. 3 (June, 2006): 427-427-448.

Hu, Frank B., Trisha Y. Li, Graham Coldits, Walter Willett, and JoAnn Manson. "Television Watching and Other Sedentary Behaviors in Relation to Risk of Obesity and Type 2 Diabetes Mellitus in Women." *The Journal of the American Medical Association* 289, no. 14 (2003): 1785-1785-1791.

Kan, Kamhon and Wei-Der Tsai. "Obesity and Risk Knowledge." *Journal of Health Economics* 23, (March, 2004): 907-907-934.

Koplan M.D., M.P.H., Jeffrey P. and Brownson, Ph.D., Ross C. "Childhood Obesity in the United States: Facts and Figures." Institute of Medicine. www.iom.edu (accessed September 20, 2007).

Krebs, Nancy F. and Marc Jacobson. "Prevention of Pediatric Overweight and Obesity." *Pediatrics* 112, no. 2 (2003): 424-424-430.

Lin, Biing-Hwan, Joanne Guthrie, and Elizabeth Frazao. "American Children's Diets Not Making the Grade." *Food Review* 24, no. 2 (2001): 8-17.

Lowe, C. F. "Food Dudes Healthy Eating Programme." http://www.fooddudes.ie (accessed November 3, 2007).

Lumeng, Julie. "What can we do to Prevent Childhood Obesity?" *Zero to Three* (January, 2005): 13-13-19, www.zerotothree.org (accessed November 3, 2007).

Mangunkusumo, Resiti T., Johannes Brug, Harry J. Koning, and Lei, Johan van der. "School-Based Internet-Tailored Fruit and Vegetable Education Combined with Brief Counselling Increases Children's Awareness of Intake Levels." *Public Health Nutrition* 10, no. 3 (2007): 273-273-279.

Milam, Garrett. Discussion of Time Preference. University of Puget Sound: October 24 (2007)

Must, Aviva. "Long-Term Morbidity and Mortality of Overweight Adolescents: A Follow-Up of the Harvard Growth Study of 1922-1935." *New England Journal of Medicine* 327, no. 19 (1992): 1350-1350-1355, findarticles.com/p/articles/mi_m0887/is_n11-12_v11/ai_13096639 (accessed September 8, 2007).

Nestle, Marion. "Soft Drink 'Pouring Rights': Marketing Empty Calories to Children." *Public Health Reports* 115, no. 4 (Jul/Aug, 2000): 308-308-319.

Neumark-Sztainer, D., M. Story, M. D. Resnick, and R. W. Blum. "Correlates of Inadequate Fruit and Vegetable Consumption among Adolescents." *Preventative Medicine* 25, no. 5 (1996): 497-505, www.pubmed.gov (accessed September 20, 2007).

Pentecost, Claire. "What did You Eat and when did You Know it?" *Art Journal* 61, no. 3 (2002): 46-46-62.

Rabkin, Rhoda. *Fatter than Ever*. Washington DC: Heritage Foundation, 2001, proquest.umi.com (accessed 9/23/2007).

Randolph, Eleanor. "The Big Fat American Kid Crisis." *New York Times,* May 10, 2006, sec. Opinion, select.nytimes.com/2006/05/10/opinion/10talkingpoints.html (accessed September 7, 2007).

Riggs, Joseph A. *Obesity as a Major Public Health Problem*. Young Physicians Meeting: Council of Scientific Affairs, 1998.

Sallis, James F. and Karen Glanz. "The Role of Built Environments in Physical Activity, Eating, and Obesity in Childhood." *The Future of Children* 16, no. 1 (2006): 89-89-108.

Tumulty, Karen. The Politics of Fat. *Time,* March, 2006. 40, www.ebscohost.com (accessed November 30, 2007).

Ulrich, Clare. "The Economics of Obesity: Costs, Causes, and Controls." *Human Ecology* 33, no. 3 (2005): 10-10-13, web.ebscohost.com/ehost/delivery?vid=17&hid=14&sid=6786038f-3f37-4f39-93bd-... (accessed 9/12/2007).

Appendix A:

AMA Graph of Advertising Exposure for 2-11 Year Olds

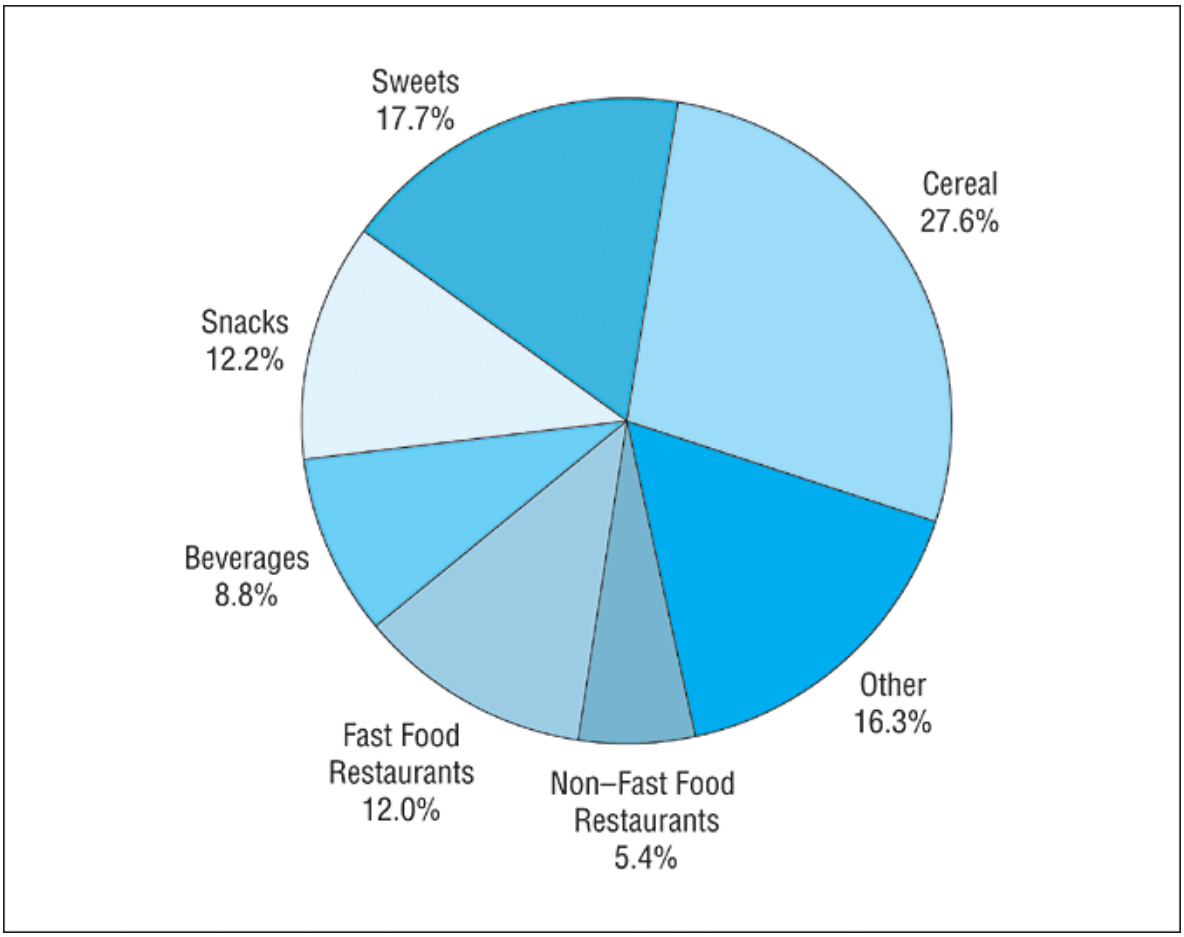


Figure. Distribution of food product advertising exposure among children aged 2 through 11 years.

< http://archpedi.ama-assn.org/cgi/content/full/161/6/553>

Attached: AMA Healthy Eating Pyramid for Children

< http://teamnutrition.usda.gov/Resources/mpk_poster.pdf>